

The button suture is still in its infancy. It will, undoubtedly, be found useful for other lesions than vesical fistula. We have, indeed, used it already for such, and shall elsewhere report a successful case.

The preceding remarks will have given some idea of "the difficulties," to use Sims' words of his own early experience, "that had to be overcome, the many disappointments that had to be borne before ultimate success; which, as it will be seen, was the work not of a day, and the result not of accident, but of long, laborious, and persevering application."

Almost every variety of vesical fistula in the female seems now to have been brought within the reach and control of art except those invading the cavity of the uterus, and the unique form reported by Simpson as a sequence to pelvic abscess, a fistula between the bladder and rectum without in the least implicating either uterine or vaginal canal.¹ The first class of these cases may yet possibly be made curable after free dilatation of the cervix uteri by carefully placed sponge-tents; but the latter, it would seem, must ever remain beyond hope.

Of other vaginal fistulæ, also the results, most of them, of pelvic abscess, and unconnected in any way with urethra or bladder, we can here say nothing. They form in their relations and treatment a most interesting group among the diseases of women, but their history has yet to be written.

H. R. S.

ART. XIII.—*Adulterations Detected; or Plain Instructions given for the Discovery of Frauds in Food and Medicine.* By ARTHUR HILL HASSALL, M. D. London, 1857.

On the Composition of Food, and how it is Adulterated; with Practical Directions for its Analysis. By W. MARCET, M. D., F. C. S. London, 1856.

THE subject of the adulteration of drugs was first brought before the notice of the American Medical Association at its annual meeting at Baltimore in 1848. A communication was then read by Dr. T. O. Edwards, at that time member of Congress from Ohio, in which an exposure was made of the great prevalence of adulteration in imported drugs, and of the evils necessarily resulting from it. The Association at that time presented to Congress a memorial on the subject, recommending prompt legislation; and a bill was accordingly passed, the same year, providing for the appointment of drug inspectors in all the principal ports of entry, whose duty it should be to examine critically all medicinal articles imported into the country, and refuse admission to such as were adulterated or in any way deficient in quality. These inspectorships have been continued from that time to the present.

The exposures which were made, at the period referred to, of the worthless character of many imported drugs, attracted immediately the attention of the profession, and will no doubt be fresh in the minds of many of our readers. The discovery that they had been for some years employing in practice opium from which the morphia had been wholly or in part extracted, or scammony which consisted of scammony, flour, gamboge, and chalk, equal parts, was naturally calculated to excite a lively interest in the minds of practical physicians. It was very evident that some check to this wholesale and injurious adulteration

¹ Edinburgh Monthly Journ. of Med. Sciences, Dec., 1852; Obstetric works.

was absolutely necessary; and the appointment of the government inspectors, mentioned above, offered the most direct and efficient means of arresting the evil.

It appears that this measure has been productive of considerable benefit. Six months after the law went into operation, Dr. Edwards made a report to the Secretary of the Treasury, in which he designated the following as the beneficial effects which had resulted from its operation:—

1. An elevation in the quality and purity of the medicinal agents imported.
2. An entire prevention of adulterated and deteriorated drugs from entry and use.
3. No embarrassment to the honest importer and dealer.
4. An increased revenue.
5. Protection to the medical profession and community, an increasing confidence, and an earnest desire on the part of the people for the continuance of the law and its faithful application.

The effect of the law was soon felt, it was said, by the European exporters, so that they ceased to send worthless medicinal articles to this country, as formerly; and consequently a much smaller proportion of the imported drugs were condemned during the second than during the first year after the establishment of the law. Indeed, a committee of the Association were informed by Dr. Bailey, drug inspector for the port of New York, in 1849, that not one-tenth of the spurious and adulterated articles arrived at that time that there did before the passage of the law. The uneasiness of the profession, which had been excited by the unpleasant discovery of the extensive existence of adulteration, was therefore somewhat quieted by the assurance that the evil was effectually arrested, or at least in a fair way to become so.

At the same time, however, a certain degree of suspicion remained behind, that the remedy which had been adopted was not, after all, completely effectual. Dr. Edwards was very possibly right when he claimed, as one consequence of the operation of the law, an entire prevention of adulterated and deteriorated drugs from *entry*; but it is by no means certain that it would as effectually prevent their *use*. If the foreign dealer and manufacturer found it a profitable business to adulterate drugs before importation, there is no reason why our own should not find it equally profitable to adulterate them afterward. The foreign adept in this kind of manufacture need not even allow the business to be taken out of his hands. It would only be requisite for him to establish a "New York Branch" of the original London or Brussels establishment, and he might then continue his operations with the same facility as before. These considerations, accordingly, still weighed with the minds of some of the profession, and prevented their being entirely satisfied with the establishment of the drug inspectorships.

The American Medical Association, furthermore, at their meeting in 1848, appointed a committee of five to report at the next meeting—*first*, the nature and extent of the sophistication and adulteration of drugs, as practised by the wholesale dealers and retail druggists; and, *second*, the best means for the prevention of the evil in its various forms.

Such a report was accordingly made in 1849. The committee state that they have made inquiries of wholesale and retail dealers respecting home frauds, "without obtaining much exact information," the dealers being found "unwilling," from some cause or other, "to give any statements except of a general character;" exciting, in this way, a natural suspicion that home adulterations had already, to a certain extent, taken the place of the foreign. The committee appear to have ascertained, however, the existence of adulteration

in many articles of domestic preparation, as well as in some of foreign manufacture which had passed the custom-house in a pure state; and they come finally to the conclusion that "there are enough" in our country "ready to engage in such dishonest work on a large scale, and so great is the temptation, now that foreign adulterations are excluded from our ports of entry, and the prices of medicines consequently enhanced, that it will require the utmost vigilance of this Association and of the public to prevent their carrying it on."

Notwithstanding this, the committee for 1850, to whom the continued consideration of the subject was intrusted, reported, in general terms, that domestic adulteration seemed at that time not to have increased, but even rather to have diminished; and that adulterated medicines were "not commonly vended in our large cities" (unless by those engaged in the sale of nostrums), except under certain particular circumstances. What these particular circumstances were, did not very clearly appear from the report of the committee. In fact, the special instances mentioned in the report showed so much impurity in the drugs actually in the market, as rather to contradict the conclusions just cited; as, for instance, where samples of rhubarb and cinchona, obtained in Boston, were respectively only one-half and one-eighth the proper strength; and where, of fifteen samples of blue mass, obtained in St. Louis, only one-third gave an approximation to the official proportion of mercury. Cod-liver oil, again, was found to be so extensively adulterated that "hardly a tenth," it was believed, of what was sold under that name was genuine, being either refined whale or sea-elephant oil. It seems rather difficult to reconcile such facts as these with the belief that adulterated medicines were "not commonly vended in our large cities."

Still, the report of this committee was, in its general conclusions, rather calculated to quiet the agitation of the subject of adulteration, and to convey the idea that it was, on the whole, not a very gross evil, at least in the Atlantic cities. The committee suggested as remedial measures the following:—

1. That the various State and local medical societies be requested to annually appoint boards of examiners, whose duty it shall be to procure specimens of drugs from the stores within their limits, for examination, and report upon the same to their respective societies at least once in every year.

2. That the respectable druggists and apothecaries throughout the United States be requested to take active measures for suppressing the fabrication and sale of inferior and adulterated drugs; and that it be respectfully suggested to them, wherever practicable, to form themselves into societies or colleges for the promotion of pharmaceutical knowledge and general improvement in their profession.

3. That a committee be appointed, consisting of one member from each State here represented, whose duty it shall be to collect information in regard to spurious and adulterated drugs, and report the same at the next meeting of the Association.

These suggestions were adopted by the Association, and a committee appointed accordingly; but nothing has since been done, so far as we know, in regard to the matter. Practically, the whole work of protecting the community against the use of adulterated medicines has been left, since 1850, to the custom-house inspectors appointed by the law of 1848.

Now, we believe that the almost universal verdict of medical men, even in the large Atlantic cities, at the present time, will be that this law has been *practically ineffectual in preventing the extensive sale and employment of spurious and adulterated drugs*. The complaints of constant disappointment in the operation of simple and important drugs, which ought to be reliable, and

of their extremely variable efficacy, were never more frequent than at the present moment. There can be little doubt that the general skepticism as to the efficacy of therapeutical agents, now so prevalent among physicians, and which has been almost constantly on the increase, is at least partly owing to the deteriorated quality of the drugs themselves. The inefficiency of the custom-house examination depends probably upon two causes. First, the inspectorships are liable, we regret to say, like almost all other government offices in our country, to be regarded as purely political appointments, and to be conferred on purely political grounds, with but little if any regard to the professional qualifications of the appointees. It is to be feared that this mode of conferring appointments has become so interwoven with our political system as to leave but little prospect of its modification for the better, and little security for the capacity, or even the integrity, of the inspectors. Even if this were not the case, however, and if we could be assured that none but genuine drugs were ever allowed to enter our ports, there would still remain a second and much greater difficulty, and one entirely beyond the reach of any custom-house supervision: that is, that drugs, as we have already intimated, are just as liable to be adulterated after as before importation. The same inducements for it are held out to the unprincipled dealer and manufacturer, and the same injurious results to the community follow from its practice.

Dr. Hassall, whose book on the adulteration of food and medicine has more recently called attention to this subject, indicates the only effectual mode of detecting these impositions. Adulterations must be detected in the samples sold or kept for sale by the retail dealer. All other inspections, whether of the crude imported or domestic material, or of the recently manufactured or wholesale article, though useful to a certain extent, must necessarily be incomplete; since adulteration may be, and certainly is, practised, according to the observations of Dr. H., at any point between the custom-house and the counter of the retail druggist. In England an excise law exists, similar in its operation to the inspectorships of the United States; and yet the amount of adulteration practised in the former country, in articles of both food and medicine, is so extensive and scandalous as to excite the indignation of any one who will take the trouble to read over the details which this book presents. *Scammony* made up of "guaiacum and jalap, with woody fibre, cellular tissue, and other insoluble matter;" *powdered jalap*, consisting, for one-third of its bulk, of rasped wood; *ipæcac.*, containing "large quantities of carbonate of lime or chalk;" *quinine*, containing gum, starch, chalk, stearine, carbonate of magnesia, &c. &c.; such are the drugs which are actually in the English market, and in daily use by practising physicians in that country.

Now it is a very essential question for us whether we are any better off, in this respect, than the English. We seem to have settled down, since 1850, into a somewhat quiescent state about this matter, trusting to the existing laws for protection. It has already been shown that these laws do not and cannot protect us. Supposing the custom-house requirements to be thoroughly and fairly carried out, the nine years which have elapsed since 1848 have certainly afforded time enough for a tolerably active and quick-witted people to learn all the tricks that were formerly done by foreigners, and to gain sufficient experience for successfully practising them at home. Some further precautions, therefore, must be adopted, unless we are willing to continue in the use of such medicines as are to be found in the market at present. A few reflections, suggested for the most part by Dr. Hassall's book, will show that the subject is fully deserving of all the consideration we may bestow upon it.

Adulteration consists in mixing with the genuine article other substances of inferior value, which increase its bulk and enhance accordingly the profits of the vendor. The foreign substances which are selected for this purpose are usually such as may be readily incorporated with the original article, so as not to be easily detected by ocular inspection. They are, in many cases, simply negative in their properties; and so far, the effect of the adulteration is merely to diminish the efficacy of the medicine; as, for example, where opium is adulterated with clay, or alcohol with water. This adulteration may be carried to such an extent that the properties of the original article are, for all practical purposes, entirely destroyed; and it then amounts to a complete substitution of other materials for those of which it should properly be composed. Hassall states, for instance, that samples are occasionally to be met with, professing to be scammony, which "do not contain a particle of that drug, or small proportions only," and are made up of a variety of ingredients, including even wood and ivory-black.

In most cases, however, the simple adulteration of a drug with an indifferent substance, or its dilution, as it might be called, is not the only or the most important alteration which it is made to suffer. The admixture of large quantities of foreign material necessarily impairs the sensible properties of the drug; and these must be restored or imitated as well as possible, by a further adulteration. Thus Cayenne, according to Dr. Hassall, is extensively adulterated with ground rice, and its colour afterward restored by the addition of red lead, or even the red sulphuret of mercury. Mustard is adulterated first with wheat flour or clay to increase its bulk, then with red pepper to give pungency to the mixture, and lastly with turmeric or chromate of lead to restore its colour. The purchaser is, therefore, not only defrauded of the article which he wishes to procure, but is supplied at the same time with other materials which are absolutely injurious.

It would seem almost superfluous to point out the injurious effects of such practices, and their disreputable character; and yet there is a tendency in the minds of some, resulting principally from a too hasty consideration of the subject, to overlook some kinds of adulteration as unimportant, or to palliate them as excusable. This has sometimes led to a distinction between injurious and harmless adulterations; the former class including those cases in which deleterious substances, such as red lead or arsenite of copper are fraudulently introduced into the mixture; the latter including those in which the bulk of the article is simply increased with some indifferent substance, as where milk is adulterated with water, or calomel with chalk. The slightest consideration will show, however, that *all* adulterations, especially in medicinal articles, are injurious and dangerous, as well as fraudulent. If we prescribe six grains of calomel to a patient who requires the operation of the drug, and three grains of the powder which he takes under that name consist of chalk, it is not merely a pecuniary loss which he suffers, but an actual bodily injury. Even should the adulteration be detected the next day, its effects cannot be counteracted by giving another similar dose of pure calomel; for the time for the most favourable operation of the drug has passed, and the patient's illness is, at the very least, prolonged for twenty-four hours. It is easy to see that much more striking cases than this, and cases quite as likely to happen, might readily be cited. But it is not necessary. There is plainly no proper distinction, except in degree, as to the danger of adulterations in medicine. They are all injurious; and those which are ordinarily the least so, may at any time become extremely dangerous, owing to the accidental circumstances of the case.

But there is another excuse which we frequently hear from those engaged in the trade, and which is too often allowed to pass current, to a certain extent, even among professional men. It is the following: There are, it is said, in all articles of merchandise, different grades of quality, corresponding to the means and taste of the purchasers. Articles of the first quality, which necessarily bear a high price, are within the reach only of the wealthy; inferior goods, at a cheaper rate must be supplied to the poorer classes, for they would otherwise be obliged to go without altogether. Accordingly, there are always to be found in the market goods of these different qualities with corresponding prices. It must necessarily be so; and in the drug trade as well as in others. There is no fraud in this, it is said. On the contrary, it is perfectly well understood that the higher priced articles are always the best, and the cheaper of an inferior quality. If the customer is willing to pay for the best article, he can have it. If he prefers to purchase at a cheap rate, he can be accommodated with an article, corresponding in quality and in price.

Now, it will be observed that the above excuse or explanation, plausible as it seems, rests entirely for its justification on the presumption that the varying quality of the article, corresponding with its price, is *perfectly well known to all parties, purchaser as well as dealer*. So long as this is the case, the variation in quality is certainly not a fraud upon the public, but rather an accommodation. When a man buys a fine broadcloth coat for thirty dollars and a rough peajacket for five, he understands perfectly well the reason for this difference in price. It is evident on mere inspection of the articles; and so long as the articles are good of their kind, and actually are what they profess to be, no harm is done, and the transaction is strictly honourable.

But the case is very different when the inferior article is fraudulently made to resemble the better one, and sold as actually being such. There is a certain class of dealers in clothing, who make a business of getting up, in this way, garments of sham quality; smooth and lustrous externally, but put together of such inferior materials, and in such an inferior manner, that they are ready to fall to pieces after a few weeks' wear. They are sold at a less price than similar garments of the best quality, but they are sold as really being such; and the unsuspecting purchaser is led to believe that he is really obtaining a good article at a lower price than he could get it for elsewhere. This kind of trade is properly regarded everywhere as dishonest; and those carrying it on are not considered as belonging to the class of respectable tradesmen.

Now, the adulteration of drugs, for the purpose of supplying a cheap and more saleable article, is the same kind of transaction with that just described. There is, and can be, in the nature of the case, no difference in the quality of the real drug. Scammony is scammony, and sulphate of quinine is sulphate of quinine; and always of the same composition. But when scammony is mixed with guaiacum and the mixture sold as scammony, or when sulphate of quinine is adulterated with chalk, and the mixture sold as sulphate of quinine, such a transaction is nothing less than the sale of one article in place of another, and is therefore fraudulent and disreputable. It is useless to say that the cheap article cannot be supposed to be as good as the high-priced one, and that the fact of its adulteration is well known to the trade. *The consumer does not know it.* The consumer buys the article, supposing it to be scammony or quinine, and not a mixture of worthless or deleterious substances. In this fact lies the fraud. The truth is, the dealer in adulterated medicines is not guided by any desire to accommodate the public, but simply to enhance his own profits: for though the spurious mixture is

sold at a less price than the pure article, it brings a higher price in proportion than it is really worth. Thus coffee is adulterated with an equal bulk of chicory, and the mixture sold at a price intermediate between its real value and that of pure coffee. Opium, from which the morphine has been extracted, is sold as a low-priced opium, when it is in reality altogether without value.

The matter, therefore, becomes perfectly simple, as soon as subjected to a moment's examination. The keeping and vending of adulterated drugs are fraudulent, no matter what may be the mode or manner of its performance. It is to be regretted, therefore, that in the report of the Committee on Adulteration, made to the American Medical Association in 1850, some expressions occur, which might be regarded as palliating its practice to a certain extent among the trade.

"Extensive inquiries among physicians, manufacturing chemists and druggists," say the committee, "have led to the following conclusions: *First*, that the wholesale druggists in the large cities, equally in the South and West as in the Eastern States, who are not specially engaged in selling nostrums, either as proprietors or agents, conduct their business on fair and honourable principles. As a general rule, they buy their choice chemicals from those who manufacture them, and either import other articles, or get them directly from those who do; and are always disposed to supply good articles to customers who are willing to pay a remunerating price. At the same time, many of this class keep inferior articles which they dispose of for a corresponding price to physicians and storekeepers who insist on buying at reduced rates."

Now, it is difficult to reconcile this trade in "inferior," that is adulterated, drugs with "fair and honourable principles" of business. These adulterated drugs are purchased by the retail dealers in order to be sold as genuine. It is not true that the public are ever parties to the transaction; or that they prefer a cheap article, knowing it to be adulterated. No man, suffering with intermittent fever, would buy a cheap quinine in preference to a high-priced one, if he knew that he would be obliged to take a teaspoonful of the former for every grain of the latter. The retail sale, which is the end and object of all previous trade-sales, is always a fraud. The wholesale dealer knows this perfectly well, and is, therefore, a party to the transaction, when he deals in articles which he knows to be destined for that purpose. Keeping and selling medicinal substances, therefore, knowing them to be adulterated, under the pretence of supplying customers who wish a cheap article, is but little, if any, less injurious and disreputable than actually making the adulteration or retailing the spurious drugs.

We have been led to make the foregoing remarks because it seemed to us that the profession in this country had been lulled into a kind of false security with regard to this subject, and to the amount of protection afforded them by the existing laws.

Dr. Hussall's book possesses a still more general interest from the fact that it treats extensively of the adulterations in food as well as of those in medicine. Indeed, the greater part of the book is occupied by the former topic. The author shows that in England at the present day the most important articles of food and drink are hardly less adulterated than medicines. Some of these adulterations are practised abroad, some of them at home; some on foreign and some on domestic articles. In some cases the genuine and spurious materials are both imported from abroad, and mixed after being brought into the country. Dr. H.'s statements have the greater value since they are not merely the result of general inquiries among manufacturers and dealers,

but of direct examination of samples purchased at retail, and consequently in the same condition as they are ordinarily obtained by the consumer.

An extremely important feature of the work is the extensive application of the *microscope* to the detection of foreign matters in alimentary or medicinal substances. Many adulterations have heretofore escaped detection in consequence of the inability of the chemist to recognize them by any means at his command. Some adulterations are so coarse that they may be recognized, by any one familiar with the appearance of the genuine article, by a careful ocular inspection; as where foreign leaves are mixed with those of tea or senna. In other instances, where inspection would fail, a chemical examination is sufficient; as where calomel is adulterated with substances which are not volatilized by heat, or which are soluble in water. There are other cases, however, principally those of powdered vegetable or animal substances, in which ocular inspection and chemistry are equally at fault; as ground coffee, for instance, adulterated with chicory or exhausted tan, or mustard adulterated with wheat flour and turmeric. Here, however, the microscope steps in and accomplishes all that could be desired; for no amount of grinding and powdering can destroy the shape of the vegetable cells and fibres, or the optical characters of starch-granules peculiar to different kinds of vegetable substances. Thus the minute anatomical structure of all the different kinds of flour is readily recognized when these are mingled together. Chicory is detected in coffee, potato flour in arrowroot, and the fibres of rasped wood in powdered opium. We know of no application of the microscope, yet made, which has been more directly and practically serviceable than this.

Tea is adulterated, according to Dr. H.'s investigations, with various foreign leaves, such as those of the beech, elm, horsechestnut, plane, willow, poplar, hawthorn, and sloe. Two or three kinds of foreign leaves are mixed with the tea by the Chinese themselves, previous to exportation. The Chinese manufacture also a spurious article for the purpose of admixture with genuine varieties, which they designate by the expressive name of "lie tea." It consists of the dust of tea-leaves, sometimes of foreign leaves, and sand, made up by means of starch or gum into little masses, which are afterwards painted and colored so as to resemble either black or green gunpowder. "This article," says Hassall, "although the chests containing it are branded with the words 'lie tea,' was at a recent period extensively imported into this country, and of course found purchasers."

But it is in the colouring and dressing of the real tea-leaves that the most important, because the most extensive and deleterious, adulteration is practised. Tea drinkers will probably be surprised to learn that with every cup of green tea they swallow so much *mineral paint*, artificially put on in order to increase the brilliancy and lustre of the leaves.

"It is with green tea," says Dr. H., "that the practice of artificially colouring the leaves is carried to the greatest extent. The varieties of green tea imported into this country from China are Twankay, Hyson-skin, Young Hyson, Hyson, Imperial, and Gunpowder. Now the colour of the whole of these teas, without a single exception, is artificial, and caused by the adhesion to the leaves of various colouring matters.

"The usual colouring matters employed are ferrocyanide of iron or Prussian blue, turmeric, and China clay. These are mixed in various proportions, so as to produce different shades of blue and green; the surface of the leaves being moistened, they are then agitated with the mixtures until they become fixed or glazed, as it is termed. Occasionally other substances are employed by the Chinese, as indigo and sulphate of lime, or gypsum. In proof that it has long been the practice frequently to colour green tea artificially, we have the evi-

dence of various travellers; but the most conclusive and complete evidence, both as to the extent of the practice and the nature of the ingredients used, has been supplied by the microscope."

In these cases, then, the consumer gets green tea, and various colouring matters in addition. But in other instances he gets the colouring matters alone. One branch of the adulterating business in England consists in buying up tea-leaves which *have been already used and exhausted*, drying them, colouring them artificially, adding sulphate of iron or catechu to restore the astringency, and reselling them as black or green tea. The colouring matters employed for this purpose Dr. H. found to be frequently more injurious than those used by the Chinese; viz., rose pink, Dutch pink, chromate of lead, Venetian red, soapstone or French chalk, carbonate of lime, carbonate of magnesia, carbonate of copper, *arsenite of copper*, Prussian blue, and indigo.

Coffee is adulterated with chiccory, roasted flour, scorched peas and beans, roasted carrots, mangel-wurzel, acorns, mahogany sawdust, burnt sugar, Venetian red, and *baked livers*. This last article is one so little likely to be suspected beforehand, that we give a short description of the process, quoted by our author from a work on coffee, published four or five years since.

"In various parts of the metropolis, but more especially in the east, are to be found liver bakers. These men take the livers of oxen and horses, bake them, and grind them into a powder, which they sell to the low-priced coffee-shop keepers, at from 4d. to 6d. a pound, horse's liver coffee bearing the highest price. It may be known by allowing the coffee to stand until cold, when a thick pellicle or skin will be found upon the top. It goes further than coffee, and is generally mixed with coffee, and other vegetable imitations of coffee."

Why baked livers should be especially selected for this purpose does not at first sight appear. It is evident enough, however, as soon as we have become a little familiar with the "fundamental principles" of adulteration. Horses' and bullocks' livers are, in the first place, cheap. Secondly, the biliary matters with which they are imbibed serve to imitate tolerably well the colour and bitterness of real coffee. They are therefore much better adapted for this purpose than other internal organs, such as the spleen, kidneys, or brains. Coffee, again, which has been largely adulterated with scorched flour or beans, has its colour and bitterness partly restored by the addition of burnt sugar.

We subjoin, as a curiosity in its way, the following, from page 119:—

Results of the microscopic examination of thirty-four different Coffees, of all qualities and prices, and sold under the following attractive titles:—

COFFEES OF HIGH PRICE.

1. *Finest Mocha Coffee.* No adulteration.
2. *Noted Old Mocha.* No adulteration.
3. *Finest Jamaica Coffee.* No adulteration.
4. *Rich Old Mocha.* Of chiccory, a good deal.
5. *Best Old Mocha.* A little chiccory.
6. *Fine Old Turkey Coffee.* Much chiccory.
7. *Very Fine Mocha.* Much chiccory.
8. *Genuine Old Mocha.* A little chiccory.
9. *Finest Turkey Coffee.* Contains chiccory.
10. *Celebrated Old Mocha.* A good deal of chiccory.

COFFEES OF MEDIUM PRICE.

11. *Costa Rica Coffee.* Nearly one-half chiccory.
12. *Fine Jamaica Coffee.* Contains a considerable quantity of roasted corn.
13. *Delicious Coffee.* Roasted beans and chiccory, forming about one-third of the article.

14. *Plantation Coffee.* Of roasted corn much, with some chiccory, both not less than one-third.
15. *Finest Turkey Coffee.* Much chiccory, and some roasted corn; very little coffee.
16. *Celebrated Jamaica.* Very little coffee; principally chiccory.
17. *Finest Berbice Coffee.* About one-half coffee, much chiccory, and some wheat.
18. *Splendid Turkey Coffee.* About one-half coffee, the rest chiccory.
19. *Fine Plantation Coffee.* One-third coffee, the rest chiccory, with a little roasted corn.
20. *Beautiful Jamaica Coffee.* Two-thirds coffee, the rest chiccory, with a little corn.
21. *Finest Java Coffee.* Half coffee, much roasted corn, with a little chiccory.
22. *Superior Plantation Coffee.* Three-fourths coffee, the remaining chiccory.

COFFEES OF LOW PRICE.

23. *Fine Mountain Coffee.* Four-fifths coffee, one-fifth chiccory.
24. *Parisian Coffee.* Principally chiccory and corn; very little coffee.
25. *Superb Coffee.* The principal part corn and chiccory; very little coffee.
26. *Rich Drinking Coffee.* One-third coffee, the rest chiccory, with some roasted corn.
27. *Very Excellent Coffee.* One-half coffee, the other mostly chiccory.
28. *Delicious Family Coffee.* One-fourth coffee, three-fourths chiccory.
29. *Fine Ceylon Coffee.* Very little coffee, a great deal of chiccory, some roasted corn.
30. *Fine Java Coffee.* Much chiccory and some roasted potato; very little coffee.
31. *Coffee as in France.* Principally chiccory.
32. *Very Excellent Coffee.* Principally chiccory.
33. *Fine Plantation Coffee.* Nearly all chiccory; very little coffee.
34. *Delicious Drinking Coffee.* A large quantity of chiccory, and much roasted corn.

Cocoa, sugar, honey, milk, flour, butter, lard, arrowroot, and their adulterations, are all described in a similar manner. With many new and unsuspected adulterations, discovered by Dr. Hassall, there are some, popularly supposed to be very common, which he shows to be either quite rare, or even not to have an existence. Thus sugar is generally thought to be extensively adulterated with sand; but Dr. H. found no sand in over one hundred samples of sugar which he subjected to examination. The impurities which he met with were starch, treacle, glucose, fragments of sugar-cane, fungous sporules, and specimens of the *acarum sacchari*. Milk, again, very seldom contains chalk, contrary to the general belief. Dr. H. did not meet with it in a single instance. The most prevalent and important adulteration of milk is with water; after which the operator adds molasses or syrup to sweeten it, salt to give it a flavour, and annatto to colour it. Starch and sheep's brains are sometimes added, in order to restore the opacity to diluted milk; but these adulterations are rare, the dealers not usually taking the trouble to practise them. These impurities would furthermore, like chalk, be at once detected, on allowing the milk to stand, by subsiding to the bottom of the vessel as a visible deposit.

A very amusing chapter is that on what the author calls "proprietary alimentary preparations;" that is, various mixtures which are prepared of cheap ingredients, patented, and then sold at a dear rate under some high-sounding title; such as *Revalenta Arabica*, *Nutritious Farina*, *Semola*, *Semolina*, and the like. These substances consist mostly of baked flour, or even of cheaper ingredients, sometimes scented and coloured, and sold at prices varying from twenty-five to sixty-eight cents per pound; their real value, according to their

composition, not exceeding in any case five or six cents per pound. Thus the author gives analyses and microscopic drawings of the following of these articles among others:—

Dubarry's Revalenta Arabica; consisting of starch-granules of the Arabian lentil, barley flour, sugar, and salt.

Wharton's Ervalenta; consisting of a mixture of the French or German lentil with a substance resembling maize or Indian corn meal.

Gardiner's Alimentary Preparation; consisting of very finely ground rice.

Leath's Alimentary Farina, or Homœopathic Farinaceous Food; consisting principally of wheat flour, slightly baked, sweetened with sugar, together with potato starch, Indian corn meal, and tapioca.

Bullock's Semola; consisting of the gluten of wheat, with a proportion of wheat starch.

Maidman's Nutritious Farina; consisting entirely of potato flour, artificially coloured of a pink or rosy hue.

Plumbe's Improved Farinaceous Food; composed of bean or pea flour, some potato flour and a little arrowroot.

Palmer's Vitaroborant; consisting of a mixture, sweetened with sugar, of wheat flour with the red or Arabian lentil.

The flour, sugar, &c., were introduced, in many of these preparations, merely to diminish the strong flavour of the lentils, which is sometimes disagreeable.

"Extremes meet," says the author; "lentils, being somewhat cheaper than peas, are supplied to many of our workhouses, to be used in the preparation of soup, &c. Thus they are not only consumed by paupers, but by the rich, the chief difference being that the latter frequently pay 2s. 9d. per pound for them."

Dr. H. suggests also one or two receipts for preparing similar mixtures, which shall have all the advantages of the patented articles, if any such there be, without their exorbitant price.

"As the cost of most of the prepared lentil powders sold as ervalenta, revalenta, &c.—viz., 2s. 9d. per pound—forms a very serious obstacle to their use, supposing that it is in any respect desirable that they should be more generally consumed, we have framed the two following receipts, whereby a considerable saving of expense may be effected:—

1st Receipt.

Red or Arabian lentil flour	. . . . .	2 lbs.
Barley flour	. . . . .	1 lb.
Salt	. . . . .	3 oz.

Mix into a uniform powder.

"The red lentil may be obtained of almost every corn chandler at about 4d. per quart; the cost of *our* ervalenta would be about 2d. per pound; and it is perfectly clear from the analyses which we have given above, that whatever may be the advantages possessed by the much vaunted ervalentas, revalentas, &c., that our article must contain them all."

2d Receipt.

Pea flour	. . . . .	2 lbs.
Indian corn flour	. . . . .	1 lb.
Salt	. . . . .	3 oz.

Mix as before.

Increase of bulk is not the only object for which adulterations are practised. We have already seen that, in the case of teas, foreign and sometimes

poisonous substances are added merely for the sake of improving the colour and external appearance of the article. This is still more remarkable in the case of *pickles*. These articles of food are almost universally more or less artificially coloured, and generally with some preparation of copper. This adulteration is sometimes so excessive as to be readily detected, even by the eye. Every one must have noticed samples of pickles kept for sale by the grocer, in which the green colour was unnaturally strong; the preserved pickles being often, in fact, greener than the same vegetables when in a fresh condition. This green colour has even sometimes a distinct and altogether unnatural shade of blue. Now, in all these instances, the colour depends upon the presence of some salt of copper; either the sulphate (blue stone) artificially added, or the acetate produced by the action of the vinegar on metallic copper. When metallic copper is used, the sulphate is frequently formed as well as the acetate, owing to the previous adulteration of the vinegar with sulphuric acid.

The examination of twenty-three samples of pickled vegetables led Dr. H. to the following conclusions:—

1. That the vinegar used for pickling is of a very weak description, the percentage of acetic acid ranging between 1.48 and 2.91. It will be remembered that vinegar of good quality ought to contain from four to five per cent. of pure acetic acid.

2. That nineteen out of twenty of the vinegars submitted to analysis, poor as they were, yet owed a portion of their acidity to sulphuric acid, the amount of which varied in the different samples from .38 to 2.52 in the 1000 grains; the largest quantity of this acid being detected in the vinegars in which the red cabbages were pickled.

3. That in the whole of the sixteen different pickles analyzed for copper, that poisonous metal was discovered in various amounts; two of the samples contained a small quantity; eight, rather much; one, a considerable quantity; three, a very considerable quantity; in one, copper was present, in highly deleterious amount; and in two, in poisonous amounts.

4. That the pickles which contained the largest quantity of copper were those which consisted entirely of green vegetables, as ghirkins and beans.

The author presents a most repulsive picture of the composition of *potted meats and fish*, as subjected to his examination. These articles are but little used in this country, but in England they are extensively employed and are generally regarded as a delicacy. The form of a homogeneous paste is, however, that which presents the greatest facility for adulteration; and these preparations are accordingly found to contain not only such ingredients as flour and starch, and to be partly made up of inferior qualities of meat and fish, but to be artificially coloured also, in most instances, with Venetian red or Armenian bole. These earthy substances are added, according to Dr. H., not only for the purpose of heightening the colour of the mixture, but also to conceal the dirt contained in the brine, in which the fish is imported.

The artificial colouring of *sugar confectionary* is much worse than the above. These articles are sometimes coloured all over with the same tint; and are sometimes parti-coloured, two or three different tints being applied, for the sake of ornament, to different parts of the same piece. From the examination of 141 samples, Dr. Hassall arrived at the following result:—

Fifty-nine were coloured with CHROMATE OF LEAD.

Eleven with GAMBOGE.

Twelve with RED OXIDE OF LEAD.

Six with BISULPHURET OF MERCURY (vermilion).

Eight with BROWN FERRUGINOUS EARTHS, Vandyke brown, umber, or Sienna.

One with INDIGO.

Twenty-four with PRUSSIAN BLUE.

Ten with a mixture of CHROMATE OF LEAD and PRUSSIAN BLUE, making several varieties of green.

One with CARBONATE OF COPPER.

Nine with ARSENITE OF COPPER.

Four with CARBONATE OF LEAD.

Enough has been said to show the great extent of the above adulterations, and the abominable consequences that are liable to result from them. It must be recollected that many of these substances, fraudulently introduced into food, are actually poisonous; and, furthermore, that some of them belong to the class known as cumulative poisons. The small quantities in which these substances are introduced, day by day, is therefore no protection against their finally producing poisonous effects. Whoever takes Cayenne pepper every day upon his salad, is liable to be dosing himself at the same time with red oxide of lead; and the lover of green tea may after a time find his eyelids swelling and his legs aching from the arsenite of copper with which the leaves were coloured. Lest it should be supposed that such dangers as these are altogether imaginary, we subjoin the following account of a case in which lead palsy was produced by taking snuff; an article which is not unfrequently coloured with chromate of lead, or the red oxide of the same metal. The case is given on no less an authority than that of Mr. Erichsen; and it is of so remarkable and interesting a character, that we extract it entire. It is from page 617 of Dr. Hassall's book:—

"Case of slow poisoning by Snuff containing Lead. By Mr. ERICHSEN.—Whilst on a professional visit in the country, last March, I was requested to see a gentleman who had been invited down to a friend's country-seat, in the hopes that change of scene and air would influence favourably an attack of paralysis, which was said to be of a rheumatic character, by which he had been disabled from work for many months past, and of which he despaired of recovering, having relinquished all treatment.

"I found the patient in bed, and somewhat exhausted by the journey down, a distance of nearly a hundred miles from his usual residence. He was peculiarly sallow, the complexion having almost an icteric tinge; but the countenance was lively and expressive, and the intellect as bright as usual.

"Mr. A. B. could stand, and, if supported, could walk, though feebly and with much difficulty. He complained much of pain about the shoulders and the fleshy parts of the thighs and legs, and especially of burning sensations in the soles of his feet. The articulations all appeared healthy; no swelling or looseness was perceptible about any of them.

"I was, however, particularly struck with the appearance of the hands and arms, which were lying powerless on the coverlid of the bed. There was marked 'wrist-drop' of both arms, the hands hanging flaccid and at right angles with the forearms, without the patient being able to extend or raise them in the slightest degree. There was, however, some slight power of extension left in the fingers, especially in those of the left hand. Though unable to extend the fingers, raise the hand, and scarcely having power to elevate the arm, Mr. B. could *flex* the fingers pretty firmly, so as to give a tolerably good grasp to whatever was put into his hand. The index finger of the right hand seemed to be the most affected, and was permanently flexed.

"There was a very marked degree of wasting of the whole mass of the extensor muscles of the forearm, so that a longitudinal hollow corresponding to the interosseous space was perceptible down the whole length of the forearm, and a very deep and marked depression in the interspace between the first and

second metacarpal bones. The hands were quite powerless, and the patient was unable to render himself the slightest assistance.

"The tongue was pale and flabby; and on examining the gums, I found a deep blue-black or leaden-coloured line around the teeth, more marked about the molars. Digestion was much impaired. Appetite capricious, with much flatulence, and occasional attacks of constipation, with colicky pains.

"On inquiring into the history of the case, I learnt that Mr. A. B., who is much devoted to literary pursuits, and habitually led a sedentary life, had for some years previously suffered from pains of a rheumatic or gouty character; that in May, 1853, he had been attacked by constipation and colic while lodging for a short time in a newly-painted house. In August of the same year he had first begun to lose power in extending his arms, finding a difficulty in raising them to put on his coat; and from this time the paralytic symptoms gradually increased, until they had assumed the degree in which I found them, when he had become reduced to a state of complete physical helplessness; though, as I have already observed, his powerful and clear intellect was as perfect as ever.

"On examining Mr. A. B., I was at once struck by the very marked 'wrist-drop,' more complete than I had ever seen before; the limitation of the paralysis to the extensors, which were greatly wasted; the existence of a blue line around the teeth; and the occurrence of occasional attacks of constipation and colic, together with flying pains in the fleshy parts of the body, with absence of all articular inflammation. These symptoms led me to the conclusion that Mr. A. B. was suffering from saturnine paralysis, and that he had been slowly poisoned by lead.

"The difficulty was, however, to ascertain how poisoning by lead could have been effected. With this view, I made diligent inquiry into the patient's habits, the water he drank, the utensils he used, &c., but could not detect any source to which the presence of the mineral in the system could be traced, except that the first attack of colic and constipation had occurred whilst temporarily lodging in a house which smelt of fresh paint; but as he soon left this, I thought it very insufficient to explain his continued and increasing sufferings. In the course of my inquiries, however, I found that he took snuff in considerable quantities; I accordingly emptied his box of its contents, and took them up to town with me with a view to further examination. The snuff was analyzed by Professor Williamson, who detected in it a considerable quantity of lead; and another supply having been procured from the shop at which Mr. A. B. was in the habit of purchasing it, was subjected to analysis by Dr. Garrod, who readily detected large quantities of the metal in it.

"Mr. A. B. was now put under treatment for saturnine paralysis. The snuff was left off; the bowels were kept open with the acidulated sulphate of magnesia; iodide of potassium was freely given in conjunction with strychnia, which was applied topically to blistered surfaces as well as administered by the hands; and galvanism was assiduously employed. Under this plan of treatment he gradually improved in all respects; the colicky symptoms rapidly disappeared, the muscular pains subsided, and the paralytic condition of the extensors was gradually removed, until at the end of July he was able to resume and to discharge public duties of a very onerous character with his usual ability and energy.

"With the above sketch we received from Mr. Erichsen a sample of the snuff which was the occasion of all the mischief. On analysis it was found to contain 1.2 per cent. of red oxide of lead; that is very much less than some of the other samples, the analyses of which have already been given."

The author goes through, in a similar manner, with the description of vinegar, spices, cheese, ale, porter, spirits, wines, &c., and their adulterations. We will not, however, dwell further on the very interesting details which he presents, but refer the reader for them to the book itself.

In conclusion, we would offer some remarks on the adulteration of food and medicine in our own country, and the means of protecting ourselves from it, for which we believe the reader is already prepared. It is plain that

the adulteration of food is a serious injury, not to the purse only, but to the health of the consumer. That of medicine is certainly not less deleterious. It is always fraudulent and may at any time become even homicidal in its consequences. By its operation all the devotion, skill, and judgment of the practical physician are set at naught. A patient has perhaps swallowed, intentionally or by accident, an overdose of laudanum. The physician who is called finds him already half comatose; and he knows that ipecac and tartarized antimony are too slow in their operation to be trusted as emetics. Sulphate of zinc is not at hand; and if it were, half of it would, perhaps, consist of Epsom salts. But there is mustard; nearly always to be found ready in every family, the most active, prompt, and local in its operation of all emetics, and the most stimulating to a semi-narcotized stomach. He mixes a liberal dose, succeeds by dint of perseverance in compelling the patient to swallow it, and awaits the result. But, unfortunately, the mustard was partly clay, partly plaster of Paris, and partly turmeric, with a little real mustard and red pepper to give it pungency. No vomiting follows. Another dose is forced down, with greater difficulty than before, with a similar ineffectual result; and by the time the assistant arrives with a stomach-pump, the patient's blood is loaded with the narcotic, and he is fairly beyond the reach of help from either medicine or surgery.

Take another instance. A physician wishes to give an emetic to a slender and delicate child, who has eaten the wrong thing at dinner and is sick in consequence. Sulphate of zinc or copper would be evidently unnecessary and inappropriate. Tartarized antimony especially is to be avoided, on account of its depressing effects and the persistence of its operation. Ipecac, mild and effectual as an emetic, without any violent depressing constitutional effects—is the drug which he judiciously selects. But his judgment is without avail; for the ten grains of ipecac administered to the little patient contain eight grains of liquorice and one of tartarized antimony.

Now, let it be remembered that such cases as these are liable to occur at any moment in the practice of any physician. Similar instances, where the immediate effects are not quite so disastrous, evidently do occur daily, and do not require to be especially designated. In view, therefore, of the moral character, the intention, and the consequences of these adulterations, there can be but one conviction as to the necessity of legislative interference, and the manner in which it should be exercised. *The adulteration of food or medicine should be made a felony; and should be placed upon the same level with the coining of false money, and the counterfeiting of bank-notes.* The dealer who vends a spurious article, knowing its character, would then be placed in the position of one who passes a counterfeit bill, knowing it to be counterfeit. The consumer would then have every reasonable protection. The honest trader would not be compelled, in self-defence, to adopt the practices of the unscrupulous, or at least to wink at their existence, as he does at present; and, finally, the practical operation of medicines would no longer disappoint the physician and discourage the patient, as they too often do at the present day. It is to be hoped that both the National Association and the local societies will continue to agitate the question, until they succeed in bringing it properly under the notice of the State legislatures.

J. C. D.